CLAIMS

I CLAIM AS MY INVENTION:

1. A thermal barrier coating material comprising a cubic matrix structure of ZrO_2 stabilized by a concentration of Y_2O_3 greater than that concentration of Y_2O_3 that would result in a peak ionic conductivity in the matrix.

2. The thermal barrier coating material of claim 1, further comprising at least 30 wt. % Y_2O_3.

3. The thermal barrier coating material of claim 1, further comprising at least 40 wt. % Y_2O_3.

4. The thermal barrier coating material of claim 1, further comprising at least 50 wt. % Y_2O_3.

5. A thermal barrier coating material comprising a cubic matrix structure of ZrO_2 stabilized by a concentration of Y_2O_3, wherein the concentration of Y_2O_3 is sufficiently high to create a quantity of multi-vacancy defect clusters in the cubic matrix structure such that the material exhibits a resistance to sintering measured as linear shrinkage to be less than 4000 ppm after exposure to 1400 °C. for 24 hours.

6. A thermal barrier coating material comprising a cubic matrix structure of a rare earth oxide selected from the group of zirconia, hafnia and titania and containing a stabilizer selected from the group of lanthia, ytterbia and yttria, the material comprising a concentration of the stabilizer greater than that concentration of the stabilizer that would result in a peak ionic conductivity in the matrix.

7. The thermal barrier coating material of claim 6, further comprising at least 30 wt. % stabilizer.

8. The thermal barrier coating material of claim 6, further comprising at least 40 wt. % stabilizer.

9. The thermal barrier coating material of claim 6, further comprising at least 50 wt. % stabilizer.

10. A thermal barrier coating material comprising a cubic matrix structure of HfO_2 stabilized by a concentration of a rare earth oxide that is greater than that concentration of the rare earth oxide that would result in a peak ionic conductivity in the matrix.

11. The thermal barrier coating of claim 10, wherein the rare earth oxide comprises Gd_2O_3.

12. The thermal barrier coating material of claim 11, further comprising at least 30 wt. % Gd_2O_3.

13. The thermal barrier coating material of claim 11, further comprising at least 40 wt. % Gd_2O_3.

14. The thermal barrier coating material of claim 11, further comprising at least 50 wt. % Gd_2O_3.